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Socioeconomic differences in the prevalence of common chronic diseases: an overview of eight European countries

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Background Few studies have compared socioeconomic inequalities in the prevalence of both fatal and non-fatal diseases. This paper aims to give the first international overview for several common chronic diseases.

Methods Micro-level data were pooled from non-standardized national health surveys conducted in eight European countries in the 1990s. Surveys ranged in size from 3700 to 41 200 participants. The prevalence of 17 chronic disease groups were analysed in relation to education. Standardized prevalence rates and age-adjusted odds ratios (ORs) were calculated.

Results Most diseases showed higher prevalence among the lower education group. Stroke, diseases of the nervous system, diabetes, and arthritis displayed relatively large inequalities (OR $>$ 1.50). No socioeconomic differences were evident for cancer, kidney diseases, and skin diseases. Allergy was more common in the higher education group. Relative socioeconomic differences were often smaller among the 60–79 age group as compared with the 25–59 age group. Cancer was more prevalent among the lower educated in the 25–59 age group, but among the higher educated in the 60–79 age group. For diabetes, hypertension, and heart disease, socioeconomic differences were larger among women as compared with men. Inequalities in heart disease were larger in northern European countries as compared with southern European countries.

Conclusion There are large variations between chronic diseases in the size and pattern of socioeconomic differences in their prevalence. The large inequalities that are found for some specific fatal diseases (e.g. stroke) and non-fatal diseases (e.g. arthritis) require special attention in equity-oriented research and policies.

Keywords socioeconomic differences, chronic diseases, working-age population, elderly, Europe

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Socioeconomic differences in general morbidity and mortality are found all over Europe.[1–3] More insight into the specific diseases that cause these socioeconomic inequalities is important not only for descriptive purposes, but also for providing an insight into the factors likely to contribute to these inequalities.

For mortality the evidence is accumulating, since studies on inequalities in mortality from specific causes of death have taught us more about the role of specific risk factors. Studies on education inequalities in lung cancer have suggested that smoking is a major contributor of socioeconomic inequalities among elderly men in many European countries.[4,5] Another study[2] observed that the relatively large socioeconomic inequalities in mortality in France and Finland are largely caused by alcohol-related external causes of death.

For morbidity the picture is less clear. For instance, several studies have examined socioeconomic inequalities in the prevalence or incidence of specific fatal chronic diseases, like cancer[6–11] and ischaemic heart disease.[12–15] However, these studies were conducted within individual countries and lack comparability due to differences in the socioeconomic indicator used, age groups studied, and the definition of diseases that were focussed on. Systematic reviews in this field also have to deal with these comparability problems. Cavelaars *et al.*[1,16] have studied socioeconomic inequalities in chronic diseases in Europe. However, they only used a summary measure of nine diseases. What is lacking is a European overview study comparing socioeconomic differences in a wide range of fatal and non-fatal chronic diseases. Therefore, the objective of this study was to provide such a broad overview of disease inequalities, that has as a primary goal not to study between country patterns, but to examine patterns valid throughout Western Europe. This knowledge would contribute to understanding the causes of the disease burden among lower socioeconomic groups.

This study used a new data set that provides estimates of education inequalities for 17 different chronic disease groups from eight European countries for men and women aged 25–79 years. This enabled us to study variations in inequalities by sex, age, country, and disease and in addition to determine whether findings from individual countries can be generalized to Western Europe as a whole.

Methods

Data source

The analytic approach of this study was based on pooling micro-level data from non-standardized nationally representative health surveys, level of living surveys, or similar national surveys from eight European countries. Table 1 provides an overview of the countries included and the characteristics of all surveys. All surveys were conducted in the 1990s. The number of respondents varied from 3700 (for Denmark) to 41 200 (for Italy). The non-response rate also varied largely from 15% (for Spain) to 43% (for The Netherlands).

Data were analysed for men and women aged 25–79 years. All people of 80 years and older were excluded, since a large proportion are institutionalized and the surveys did not include institutionalized persons.

Chronic diseases

The data were analysed for 17 self-reported chronic disease groups (see Appendix Table A1 for the disease descriptions). The data were collected by providing participants with a list of chronic diseases for which they had to specify whether or not they had each disease. However, for France the measurement consisted of self-reported data obtained from interviews and corrected by physicians on the basis of information on medications and treatment. We only included chronic disease groups for which we had data from at least three countries. For each country, we only analysed those diseases for which at least 50 persons aged 25–79 years reported the disease.

Socioeconomic indicator

Education was selected as the socioeconomic indicator, since it was measured in a fairly comparable way between countries. For each country, a group containing the lowest education levels (no education and primary education) and a group containing the higher education levels (secondary education, post secondary education, and tertiary education) of the International Standard Classification of Education (ISCED)[17] were distinguished. The proportion of the population in the lower group is provided in Table 1. For Belgium and The Netherlands, respectively, lower secondary education and secondary education were also included in the lowest education group. This was done as the education distribution of the population was differentially skewed in these countries compared with others (with 79 and 80%, respectively, in the highest education group), consequently the lowest education group would lack statistical power.

Analysis

The standardized prevalence of each chronic disease group was calculated per country using the direct method of standardization. The standard was the 1995 combined population distribution for all countries included in our study.

To describe the magnitude of the socioeconomic differences, odds ratios (ORs) were calculated by means of logistic regression

Table 1 Countries and surveys included in the study

Country	Year	Name	Total number of respondents of age 25–79	Population share (%) by lower education level		Estimate of the overall non-response rate (%)
				Men	Women	
Finland	1994	Survey on Living Conditions in Finland	7385	37.8	38.5	27
Denmark	1994	The Danish Health and Morbidity Survey	3717	21.4	29.0	22
Great Britain	1995	Health Survey for England	12 556	33.8	43.8	27
The Netherlands	1997–1999	Permanent Survey on Living Conditions	19 102	38.6	53.3	43
Belgium	1997	Belgium Health Interview Survey	6960	40.9	44.7	40
France	1991–1992	Enquête sur la Santé et les Soins Médicaux	12 569	58.4	56.7	34
Italy	1994	Condizioni di salute e ricorso ai servizi sanitari	41 240	34.4	43.7	10 (of families)
Spain[a]	1997	Encuesta Nacional de Salud	4943	44.6	48.4	15

For men the population share of the lowest education level was 55.73% and for women this was 62.37%. The overall non-response rate in this survey was 5%.

[a] When data from Spain were not available, data from the Encuesta de Salut de Cataluña of 1994 were used. The total number of respondents in this survey was 9532.

with control for 5-year age groups. The OR (with 95% confidence interval (CI)) compared the lower education level with the higher education level.

In a pooled analysis we calculated ORs (and 95% CI) for all European countries combined. In these analyses country-specific weights, based on survey sizes, were assigned to the individual observations, so that the separate populations carried equal weight in the results. For example, surveys with 4000 participants received twice the weight of surveys with 8000 participants. The weights of all individual countries taken together sum up to 1. Due to confidentiality policies of Statistics Netherlands, micro-level analyses of Dutch data could only be done on the computer of Statistics Netherlands. It was therefore not possible to include the Dutch data in the pooled analyses.

For each disease we tested on the pooled data if an interaction effect was present between education and country among men and women aged 25–79 years. This was done for each disease by calculating the −2 log likelihood of a model with and without the interaction term. Comparison of the two models determined which one fitted the data better.

Results

Table 2 gives an overview of the country-specific prevalence rates for persons aged 25–79 years. Due to differences in survey questions and disease definitions, there were sometimes large differences between countries in the prevalence rate of specific disease groups. An extreme example is the group of back and spinal cord disorders where the prevalence rate ranged from 4.0 per 100 respondents in Great Britain to 24.0 per 100 respondents in Denmark. Diseases with high prevalence rates (>10 per 100 in at least one country) were diseases of the nervous system, hypertension, headache/migraine, chronic respiratory disease, genitourinary diseases, osteoathrosis, back and spinal cord disorders, skin diseases and allergy.

Table 3 summarizes the pooled ORs for the different diseases. Socioeconomic inequalities were observed for most chronic disease groups in Europe. There were large socioeconomic disparities (OR >1.50) for stroke, diseases of the nervous system, diabetes mellitus, and arthritis. There were smaller socioeconomic differences for the other disease groups. No significant socioeconomic inequalities could be demonstrated for cancer, kidney stones and other kidney diseases, and skin diseases (CI includes 1). Allergy, with an OR of 0.78, was more prevalent among the high education group.

Socioeconomic differences in chronic disease groups were observed among men and women, but the size differed between the sexes (Table 3). Inequalities were often larger among women as is the case for diabetes, hypertension, and heart disease. The ORs for these diseases were, respectively, 2.19, 1.52, and 1.51 for women and 1.30, 1.10, and 1.18 for men. Except for diabetes in The Netherlands and Great Britain, and for heart disease in Great Britain, this pattern was found in all countries (results available upon request). Substantially larger differences among men were observed for back and spinal cord disorders.

Table 3 shows that socioeconomic disparities in chronic diseases were observed among the working-age population (25–59 years) and also among the elderly (60–79 years) for most diseases. Socioeconomic differences were often, in relative terms, larger among the working-age population compared with the elderly. Among the working-age population cancer

Table 2 The prevalence rate for chronic disease groups for persons aged 25–79

	Rate (per 100 respondents)							
Chronic disease groups	Finland	Denmark	Great Britain	The Netherlands	Belgium	France	Italy	Spain
Stroke			0.4	0.8	0.8	4.7	1.1	1.3[a]
Diseases of the nervous system	11.0	4.6	2.0	0.6	8.0	7.5	3.8	
Diabetes mellitus		5.0	1.5	2.9	3.6	3.3	4.6	5.6
Arthritis			5.8	4.6	10.8			
Hypertension		13.2	3.0	11.9	13.8	16.3	13.4	12.8
Stomach/duodenum ulcer		3.5	1.4	1.5		1.7	5.1	3.9
Genitourinary diseases	2.3		1.0	2.9	4.4	11.0	1.2	7.2[a]
Headache/migraine		16.5	0.9	7.8	12.6	8.7	10.7	
Osteoarthrosis				11.1	13.8	9.0		
Liver/gall diseases				1.3	2.4	1.7	3.2	
Chronic respiratory diseases	10.0	14.5	5.3	8.1	8.4	5.3	7.8	4.7
Heart disease			3.0	3.4	4.6	6.5	2.8	4.9
Back and spinal cord disorders		24.0	4.0	11.5	14.2	19.2		
Cancer	1.5		1.0	1.5	1.5	3.6	1.0	
Kidney stones and other kidney diseases			0.4	1.2	2.0	1.1	2.0	
Skin diseases	4.6	17.0	1.3	1.7	3.4	9.4		6.1[a]
Allergy		21.5			13.0		8.9	7.3

[a] Because data from Spain were lacking, data from Cataluña were used.

Table 3 Education differences (low vs high education) for chronic disease groups in Europe

	OR (95% CI)				
Chronic disease groups	Total	Men (Aged 25–79)	Women (Aged 25–79)	Men and women (25–59 years)	Men and women (60–79 years)
Stroke	1.64 (1.40–1.93)[a]	1.70 (1.35–2.14)[a]	1.56 (1.25–1.96)[a]	1.89 (1.43–2.51)[a]	1.53 (1.27–1.86)[a]
Diseases of the nervous system	1.63 (1.51–1.77)[a]	1.57 (1.40–1.77)[a]	1.57 (1.41–1.75)[a]	1.81 (1.64–1.99)[a]	1.33 (1.17–1.52)[a]
Diabetes mellitus	1.60 (1.43–1.80)[a]	1.30 (1.11–1.51)[a]	2.19 (1.82–2.63)[a]	1.64 (1.38–1.94)[a]	1.57 (1.34–1.84)[a]
Arthritis	1.56 (1.40–1.73)[a]	1.50 (1.27–1.77)[a]	1.46 (1.26–1.68)[a]	2.04 (1.76–2.36)[a]	1.17 (1.01–1.36)[a]
Hypertension	1.42 (1.34–1.50)[a]	1.10 (1.00–1.22)	1.52 (1.42–1.62)[a]	1.55 (1.43–1.67)[a]	1.30 (1.20–1.40)[a]
Stomach/duodenum ulcer	1.40 (1.22–1.60)[a]	1.41 (1.19–1.67)[a]	1.56 (1.25–1.95)[a]	1.37 (1.15–1.62)[a]	1.46 (1.16–1.83)[a]
Genitourinary diseases	1.35 (1.24–1.47)[a]	1.29 (1.13–1.48)[a]	1.53 (1.36–1.72)[a]	1.51 (1.35–1.69)[a]	1.15 (1.00–1.31)
Headache/migraine	1.35 (1.27–1.43)[a]	1.18 (1.06–1.32)[a]	1.29 (1.20–1.39)[a]	1.28 (1.20–1.37)[a]	1.62 (1.42–1.84)[a]
Osteoarthrosis	1.34 (1.21–1.49)[a]	1.32 (1.12–1.55)[a]	1.29 (1.12–1.48)[a]	1.51 (1.30–1.75)[a]	1.20 (1.03–1.38)[a]
Liver/gall diseases	1.26 (1.08–1.46)[a]	1.10 (0.87–1.40)	1.30 (1.07–1.58)[a]	1.31 (1.07–1.60)[a]	1.19 (0.95–1.49)
Chronic respiratory diseases	1.24 (1.15–1.33)[a]	1.33 (1.20–1.48)[a]	1.19 (1.07–1.33)[a]	1.13 (1.03–1.25)[a]	1.42 (1.26–1.61)[a]
Heart disease	1.22 (1.10–1.35)[a]	1.18 (1.04–1.34)[a]	1.51 (1.28–1.79)[a]	1.29 (1.09–1.53)[a]	1.18 (1.04–1.33)[a]
Back and spinal cord disorders	1.19 (1.11–1.29)[a]	1.33 (1.19–1.49)[a]	1.05 (0.94–1.16)	1.29 (1.18–1.41)[a]	0.98 (0.86–1.13)
Cancer	1.13 (0.98–1.30)	0.96 (0.78–1.20)	1.22 (1.02–1.46)[a]	1.64 (1.36–1.99)[a]	0.77 (0.64–0.93)[a]
Kidney stones and other kidney diseases	1.11 (0.95–1.31)	1.03 (0.83–1.27)	1.34 (1.04–1.72)[a]	1.17 (0.95–1.45)	1.03 (0.80–1.33)
Skin diseases	0.99 (0.91–1.08)	0.99 (0.86–1.14)	0.98 (0.87–1.11)	0.98 (0.88–1.09)	1.03 (0.86–1.23)
Allergy	0.73 (0.66–0.81)[a]	0.67 (0.57–0.79)[a]	0.72 (0.63–0.82)[a]	0.69 (0.61–0.78)[a]	0.82 (0.68–0.99)[a]

[a] Confidence interval excludes 1.

was more prevalent in the lower education group (OR = 1.64). Among the elderly cancer was more prevalent in the higher educated (OR = 0.77). Except for The Netherlands, this reversal was found in all countries (results available upon request). Larger socioeconomic differences among the elderly were found for chronic respiratory diseases and headache/migraine.

Table 4 gives an overview of the country-specific ORs for persons aged 24–79 years. The patterns that are found for a specific disease group often differ in the individual countries. For example for chronic respiratory diseases there were large differences (OR $>$ 1.5) for Belgium, Italy, and Spain, and no differences for Finland and France (CI includes 1). When determined if the country specific ORs (Table 4) fell within the CI of the OR per disease for Europe combined (Table 3), we noticed that for Finland and France the ORs were generally smaller, but larger for Belgium. For example, for Finland and France the ORs for genitourinary disease were smaller than the one for Europe (with no overlapping CIs). For Belgium the ORs of chronic respiratory diseases and back and spinal cord disorders were much larger for example than the ones for Europe (with no overlapping CIs). The results of the interaction tests indicated that for more than half of the diseases, the magnitude of the socioeconomic inequalities varied significantly between the countries (the *P*-value of the interaction term 'education by country' was smaller than 0.05). However, only for heart disease the socioeconomic differences were consistently larger in northern European countries (Great Britain, The Netherlands and Belgium) as compared with more southern European countries (France, Italy and Spain). This pattern was visible among the 25–79 age group, but was even more clearer among the working-age population (results available upon request).

Discussion

Evaluation of data and methods

Precise country comparisons may be problematic for several reasons. For example, both the distribution of respondents over the two education groups and the social meaning of the two groups differed between the countries. Additionally, national surveys differed in for example, sampling frames, response rates and survey questions on chronic diseases although the surveys were nationally representative. One particular noteworthy limitation was the differences between countries in the specific diseases included in the disease groups, making detailed country comparisons impossible. Therefore, we aimed to study general patterns that appear across all European countries. Consequently we restrict the discussion of data problems to those that could have biased these general patterns.

An important problem could be the high non-response rate of some of the surveys. There is some evidence that the non-response is generally higher among lower socioeconomic groups[18–21] and among the less-healthy.[18,20,21] This could result in an underestimation of the socioeconomic health inequalities. This bias could therefore be larger in countries with a higher non-response rate, like Belgium and The Netherlands.

Exclusion of institutionalized persons (for instance those living in nursing homes and homes for the elderly) from the surveys in our study could be another problem. Recent data indicate that people of a lower socioeconomic status[22,23] and the less healthy[22,24] have a higher prevalence of institutionalization. Consequently, the socioeconomic differences could be underestimated to a different extent in each country. The bias in our study is however probably minimal since our study excluded

Table 4 Education differences (low vs high education) for chronic disease groups for persons aged 25–79

Chronic disease groups	OR (95% CI) Finland	Denmark	Great Britain	The Netherlands	Belgium	France	Italy	Spain	Interaction between education & country[b]
Stroke			2.23 (1.29–3.86)[c]	1.65 (1.09–2.49)[c]	1.38 (0.79–2.41)	1.30 (1.04–1.63)[c]	1.47 (1.15–1.86)[c]	1.31 (0.79–2.17)[a]	$P = 0.43$
Diseases of the nervous system	1.06 (0.90–1.26)	1.14 (0.70–1.86)	1.29 (1.03–1.61)[c]	1.39 (0.91–2.14)	1.99 (1.65–2.39)[c]	0.97 (0.84–1.11)	1.85 (1.62–2.11)[c]		$P < 0.0001$
Diabetes mellitus		1.16 (0.74–1.82)	1.26 (0.98–1.62)	1.60 (1.28–1.99)[c]	1.98 (1.49–2.62)[c]	1.45 (1.13–1.87)[c]	1.59 (1.41–1.78)[c]	1.99 (1.38–2.87)[c]	$P < 0.001$
Arthritis			1.73 (1.51–1.98)[c]	1.48 (1.26–1.75)[c]	1.44 (1.22–1.69)[c]				$P < 0.01$
Hypertension		1.03 (0.76–1.39)	1.33 (1.11–1.59)[c]	1.17 (1.05–1.31)[c]	1.22 (1.06–1.42)[c]	1.42 (1.25–1.60)[c]	1.26 (1.17–1.35)[c]	1.15 (0.92–1.44)	$P < 0.0001$
Stomach/duodenum ulcer		2.16 (1.27–3.68)[c]	1.46 (1.12–1.90)[c]	2.24 (1.67–2.99)[c]		1.73 (1.25–2.39)[c]	1.35 (1.22–1.50)[c]	1.45 (0.99–2.11)	$P = 0.45$
Genitourinary diseases	0.84 (0.60–1.19)		0.91 (0.66–1.26)	1.27 (1.02–1.58)[c]	1.43 (1.12–1.82)[c]	0.86 (0.76–0.97)[c]	0.63 (0.52–0.76)[c]	1.23 (1.00–1.51)[a]	$P < 0.0001$
Headache/migraine		1.72 (1.27–2.32)[c]	1.05 (0.75–1.49)	1.25 (1.11–1.42)[c]	1.34 (1.15–1.57)[c]	1.19 (1.04–1.36)[c]	1.37 (1.27–1.47)[c]		$P < 0.0001$
Osteoarthrosis				1.61 (1.43–1.80)[c]	1.54 (1.32–1.78)[c]	1.43 (1.22–1.68)[c]			$P = 0.59$
Liver/gall diseases				1.80 (1.32–2.45)[c]	1.55 (1.11–2.16)[c]	1.20 (0.88–1.65)	1.19 (1.05–1.35)[c]		$P = 0.50$
Chronic respiratory diseases	1.07 (0.89–1.27)	1.44 (1.08–193)[c]	1.34 (1.17–1.54)[c]	1.23 (1.09–1.39)[c]	1.70 (1.42–2.04)[c]	1.19 (0.99–1.43)	1.69 (1.55–1.86)[c]	1.82 (1.25–2.64)[c]	$P < 0.0001$
Heart disease			1.29 (1.08–1.55)[c]	1.20 (0.98–1.46)	1.63 (1.27–2.08)[c]	1.07 (0.89–1.28)	1.09 (0.95–1.25)	0.89 (0.64–1.24)	$P < 0.01$
Back and spinal cord disorders		1.16 (0.89–1.49)	0.90 (0.76–1.05)	1.17 (1.06–1.30)[c]	1.53 (1.32–1.76)[c]	1.09 (0.98–1.20)			$P < 0.0001$
Cancer	0.86 (0.56–1.33)		1.20 (0.89–1.62)	1.23 (0.92–1.64)	1.08 (0.73–1.61)	0.90 (0.73–1.11)	0.98 (0.78–1.22)		$P = 0.18$
Kidney stones and other kidney diseases			1.11 (0.69–1.80)	0.95 (0.70–1.30)	1.22 (0.85–1.74)	0.98 (0.67–1.43)	1.19 (1.01–1.40)[c]		$P = 0.25$
Skin diseases	0.96 (0.74–1.24)	0.85 (0.61–1.18)	0.89 (0.67–1.19)	1.12 (0.86–1.45)	1.09 (0.83–1.43)	0.95 (0.83–1.08)		1.14 (0.92–1.41)[a]	$P < 0.0001$
Allergy		0.53 (0.39–0.74)[c]			0.79 (0.68–0.92)[c]		1.03 (0.94–1.12)	0.77 (0.58–1.01)	$P < 0.0001$

[a] Because data from Spain were lacking, data from Cataluña were used.

[b] It was not possible to use data from The Netherlands in these analyses.

[c] Confidence interval excludes 1.

people of 80 years and older, who have a high chance of being institutionalized. Data on Finland, Denmark, Belgium, and Italy show that only about 1% of the persons aged 60–79 years were institutionalized (data available upon request).

A potentially important problem is that the data on chronic diseases were based on self-reports. Reporting a health problem not only depends on the actual presence of a clinical condition, but may also depend, among other things, upon characteristics of the respondents like their knowledge about the problem, their ability to recall it, the consequence of the illness for everyday life, their willingness to report it, and their frequency of contact with a physician.[25–27] These factors might vary by gender. Considering these issues, one could therefore question the reliability and validity of self-reports. However, when self-reports of chronic diseases are compared with physician-reported medical histories, several diseases still display substantial accuracy. This has been found for cardiac disease,[26,28,29] cancer,[26,28] and diabetes.[26–28] Chronic non-specific lung disease[28] and cerebrovascular disease[28] display moderate accuracy. However, for nervous diseases,[29] arthritis,[27,28] lower back disorder,[30] and hip and knee osteoarthrosis[30] the accuracy is low. However, the socioeconomic differences will be biased only if under reporting or overreporting is associated with the education level of the respondent. In two Dutch studies[31,32] a greater underreporting of cancer, diabetes mellitus, chronic non-specific lung disease, and especially heart disease was found among the lower educated. A US study[27] found that arthritis was overreported more frequently among persons with less education. A Spanish study[33] found greater underreporting of hypertension among the higher educated. Thus if self-reports have biased our results, this may have resulted in an underestimation of the socioeconomic inequalities in most, but not all, cases. How large the inaccuracy is in the different countries remains uncertain, as there may also be regional differences in the inclination to report diseases.

Evaluation and explanation of existing patterns

Studies on socioeconomic inequalities in chronic diseases from individual countries observed, as we did in our study, an inverse gradient, for the risk of developing a dementia disorder,[34] the incidence of epilepsy,[36] mean blood pressure level and the prevalence of hypertension,[37–39] the duration and recurrence of back pain,[40] the prevalence of diabetes mellitus,[34,35] peptic ulcer,[41] and chronic bronchitis,[42,43] and the prevalence and incidence of cardiovascular disease,[44] stroke,[45–47] and chronic obstructive lung disease.[48–50] Other studies also reported a higher prevalence among the high socioeconomic groups for allergy[51] or hay fever.[52,53] Some of our results differed from that of other studies. We found an inverse social gradient for headache/migraine and arthritis. Some studies on headache/migraine[54] and arthritis[55,56] have observed the same gradient, while others[57–60] have observed no gradient. We found no socioeconomic inequalities for skin disease. Previous studies on atopic dermatitis/eczema among children observed a higher prevalence in the higher socioeconomic groups.[61–63] Lastly for (severe) asthma, which is included in our definition of chronic respiratory diseases, conflicting socioeconomic inequalities have been reported in literature.[52,64–67]

Allergy displayed a positive relation with education among the working-age population. This relation was also found for eczema among children.[61] Aspects of the home environment such as central heating, type of bedding, use of carpets, and decreased air circulation because of better insulation, of the affluent populations may increase the risk of eczema and allergy by influencing house dust mite populations.[61] Other risk factors of higher socioeconomic groups might be overuse of showers or soaps, increased contact with pets, and greater use of synthetic clothing. Prenatal exposures such as higher maternal age at birth and different maternal diet may also play a role.[68]

For many diseases, relative socioeconomic differences were smaller among the elderly compared with the working-age population. What may play a role is mortality selection. One can expect that if premature mortality is related to social class, mortality selection is then accordingly larger among the lower than the higher socioeconomic group.[69–71] This might diminish health inequalities among the elderly, since the lower educated with worse health would die younger, resulting in a more healthy lower educated elderly population. Additional support for this mortality selection effect can be found in the size of the absolute inequalities (results available upon request). Although the prevalence of most diseases increased with age, absolute inequalities did not always increase with age. In about half of the cases where relative differences were larger among the working-age population compared with the elderly, absolute differences were also larger among the younger population.

Cancer was more prevalent in the lower education group among the working-age population and was more prevalent in the higher education group among the elderly. Previous studies observed that for some types of tumours the risk was higher among the lower socioeconomic group, while for others the risk was higher among the higher socioeconomic group.[6–11,72–76] Smith *et al*.[73] suggested that fatal cancers are more common among lower socioeconomic groups. If consequently more lower educated with cancer die prematurely while higher educated with the less lethal cancer types survive to an older age, this could make cancer among the elderly more prevalent among the higher educated.

Another finding of our study was that socioeconomic differences in diabetes, hypertension, and heart disease were larger among women compared with men. A recent literature review found a stronger and more consistent relation between mean blood pressure and education among women.[37] Connolly *et al*.[35] also reported a steeper social gradient for the prevalence of diabetes among women. Obesity and physical inactivity, both of which have larger inequalities among women than men, were mentioned as explanatory variables.[35,37] Since diabetes and hypertension are both risk factors for heart disease this may contribute to greater socioeconomic differences in heart disease among women.

A last major finding was that the socioeconomic differences in heart disease were larger in northern than southern European countries. This same north-south pattern is also found for mortality from ischaemic heart disease.[2,4] The overall lower mortality of heart disease in Southern Europe is often attributed to their healthy Mediterranean diet.[77] If lower and higher socioeconomic groups equally benefit from this healthier diet, this could partly explain the smaller socioeconomic inequalities

in heart disease in this region. The phases in which smoking was spread across Europe during previous decades[78–80] may also contribute to the north-south pattern in socioeconomic differences in heart disease prevalence. Southern Europe lagged behind in the spread of the smoking epidemic compared with Northern Europe. In the phase where smoking became more and more concentrated among the lower socioeconomic groups in northern Europe, smoking was still more equally divided among the higher and lower socioeconomic groups in southern Europe.

Conclusions

This descriptive study gives the first international overview of socioeconomic differences in a large number of chronic diseases. By pooling data from several countries we were able to detect patterns that were observed throughout Western Europe. However, it was not possible to standardize methods in such a way that between country comparisons could be easily made. For future benchmarking and surveillance of health inequalities in Europe, much effort should be made to standardize questions on chronic diseases between national surveys.

By combining data sets from several European countries, we identified large variations between chronic diseases with regard to socioeconomic differences in their prevalence. Similar variations between disease groups were observed for fatal diseases in previous studies on mortality.[2,4] These findings have important implications for equity-oriented health research and policies. First, the results underline that research on the basis of interview surveys should not exclusively focus on generic health indicators such as general self assessed health, but give ample attention to the prevalence of specific diseases. Second, research that aims to explain health inequalities may be more fruitful when it would focus on those diseases, and their direct determinants, for which socioeconomic differences are largest. Third, the importance of non-fatal diseases such as arthritis remained undetected in mortality studies. Even though reducing inequalities in mortality should remain a high priority, the burden of non-fatal but disabling diseases should not be ignored. Next to reducing inequalities in fatal diseases, a major challenge lies in reducing the onset and course of important non-fatal diseases among lower educated persons.

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Disclaimer

The views expressed in this paper are those of the authors and do not necessarily reflect the opinions of Statistics Netherlands.

KEY MESSAGES

- This study is the first European overview of socio-economic differences in the prevalence of several common fatal and non-fatal diseases.
- The largest differences were observed for stroke, diseases of the nervous system, diabetes, and arthritis, while no differences or even inverse differences were observed for cancer, kidney diseases, skin diseases, and allergy.
- Relative socio-economic differences were often smaller among the 60–79 group compared with the 25–59 group.
- For diabetes, hypertension and heart disease, socio-economic differences were larger among women compared with men.
- The relatively large inequalities in some specific fatal diseases and non-fatal diseases require special attention in equity-oriented research and policies.

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Appendix

Table A1 The description of the chronic disease groups per country

Chronic disease groups	Finland	Denmark	Great Britain	The Netherlands	Belgium	France[a]	Italy	Spain
Stroke			• Stroke, cerebral haemorrhage, cerebral thrombosis	• Stroke and complications stroke	• Stroke and complications stroke	• Cerebrovascular disease	• Stroke	• Stroke[b]
Diseases of the nervous system	• Nervous system and sense organs	• Paralysation in parts of the body • Epilepsy	• Epilepsy, fits, convulsions • Other problems of nervous system	• Epilepsy	• Parkinsons • Epilepsy	• Diseases of the nervous system	• Paralysis and parasis • Nervous disorder (memory loss, Parkinsons, alzheimer epilepsy)	
Diabetes mellitus		• Diabetes	• Diabetes (incl. hyperglycaemia)	• Diabetes	• Diabetes	• Diabetes mellitus	• Diabetes	• Diabetes
Arthritis			• Arthritis, rheumatism, fibrositis	• Chronic rheumatism, or rheumatic arthritis of hands or feet • Other rheumatoid arthritis (>3 months)	• Arthritis hands and feet • Other rheumatoid arthritis (>3 months)			
Hypertension		• High blood pressure	• Hypertension, high blood pressure, blood pressure (nes)	• Hypertension	• Hypertension	• Hypertension	• Hypertension	• Hypertension
Stomach/duodenum ulcer		• Peptic ulcer	• Stomach ulcer, ulcer (nes), abdominal hernia, rupture	• Stomach or duodenum ulcer		• Ulcer	• Gastric ulcera	• Ulcer of Stomach
Genitourinary diseases	• Genitoruinary system		• Urinary tract infection • Other bladder problems, incontinence • Reproductive system disorders	• Chronic bladder inflammation • Prolaps of uterus	• Prolaps of uterus • Prostate complaints • Chronic cystitis	• Other diseases of urinary system • Diseases of male genital organs • Inflammatory disease of femele pelvic organs • Other disorders of female genital track	• Prostatic hypertrophy	• Urinary disease[b]
Headache/migraine		• Migraine	• Migraine, headaches	• Migraine	• Migraine	• Headache • Migraine	• Recurrent headache or migraine	

Osteoarthrosis				• Arthrosis (knees, hips and hands)	• Arthrosis (knees hips and hands)	• Osteoarthrosis and allied disorders		
Liver/gall diseases				• Liver disease, liver cirrhosis • Gall stones, inflammation gallbladder	• Gall stones inflammation gallbladder • Hepatitis	• Other diseases of digestive system (liver and gall diseases)	• Liver/gal calculosis • liver cirrhosis	
Chronic respiratory diseases	• Respiratory system	• Bronchitis • Asthma	• Bronchitis, emphysema • Asthma • Other respiratory complains	• Asthma, chronic bronchitis, cara	• Asthma, chronic bronchitis, cara	• Chronic obstructive pulmonary disease and allied conditions	• Chronic bronchitis emphysema, respiratory failure • Asthma	• Asthma or bronchitis
Heart disease			• Heart attack, angina • Other heart problems	• Serious heart diseases or myocardial infarction	• Serious heart disease	• Diseases of the tractus circulatoris	• Myocard infarct • Angina pectoris	• Heart disease
Back and spinal cord disorders		• Back disorder	• Back problems, slipped disc, spine, neck • Other problems of bones, joints, muscles	• Serious back complaints (>3 months) or hernia	• Chronic spinal cord affection > 3 months	• Dorsopathies (and other back disorders and spinal cord affections)		
Cancer	• Neoplasm		• Cancer	• Cancer	• Maligna neoplasm or cancer	• Neoplasm	• Cancer	
Kidney stones and other kidney diseases			• Kidney complaints	• Kidney stones • Serious kidney disease	• Kidney stones • Other kidney diseases	• Nephritis, nephrotic syndrome and nephrosis • Other diseases of urinary system	• Renal calculosis	
Skin diseases	• Skin subcutaneous tissue	• Eczema • Psoriasis	• Skin complaints	• Serious skin disease	• Serious or chronic skin disease	• Diseases of skin and subcutaneous tissue		• Skin disease[b]
Allergy		• Allergy			• Allergy		• Allergy	• Allergy

[a] Cancer ICD-9 codes 140–239, Diabetes Mellitus ICD-9 code 250, Diseases of the nervous system ICD-9 codes 320–326, 330–349 (exclusive 346) & 350–359, Headache/migraine ICD-9 code 784.0 & 346, Hypertension ICD-9 codes 401–405, Heart disease ICD-9 codes 391, 392.0, 393–398& 410–429, Stroke ICD-9 codes 430–438, Chronic respiratory diseases ICD-9 codes 490–496, Stomach/duodenum ulcer ICD-9 codes 531–534, Liver/gall diseases ICD-9 codes 570–576, Kidney stones and other kidney diseases ICD9-codes 580–589 & 590–593.2, Genitourinary diseases ICD-9 codes 593.3–608 & 614–629, Skin diseases ICD-9 codes 680–702, 705–709, Osteo-arthrosis ICD-9 codes 715, Back disorder and spinal cord affections ICD-9 codes 720–724, 730.4, 732.0, 737, 738.4, 738.5 & 739.1–739.4.

[b] Because data from Spain were lacking, data from Cataluña were used.